

REMARKS

Claims 1-46 are currently pending in the application, with claims 1, 2, 19, 43 and 44 being independent. Claims 1-44 were pending prior to the Office Action. In this Reply, claims 45 and 46 have been added. Claims 1-3, 19, 43 and 44 have been amended.

The Examiner is respectfully requested to reconsider the rejections in view of the amendments and remarks set forth herein. Applicant respectfully requests favorable consideration thereof in light of the amendments and comments contained herein, and earnestly seeks timely allowance of the pending claims.

Claim Rejections - 35 USC §102

The Examiner rejected claims 1-7, 11-13, 15-16, 18-27, 31-33, 35-36, 39-40, 42-44 under 35 U.S.C. 102(e) as being anticipated by US 7,139,028 ("Itano et al.").

This rejection is respectfully traversed.

Applicant has amended claim 1 to recite a color solid-state image pickup device including a plurality of photoelectric conversion areas [...] and a light-shielding film, wherein the inside of each of said photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments [...], and wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas.

Applicant has also amended claim 2 to recite that transfer channels, for transferring said signal electric charges read from a plurality of said segments, are formed beside said photoelectric conversion areas, along perimeters of said photoelectric conversion areas that are partitioned into said plurality of segments which store said signal electric charges of different spectral sensitivities.

Applicant has also amended claim 19 to recite that peripheral circuits connected to said segments are arranged around said photoelectric conversion areas, along perimeters of said photoelectric conversion areas.

Applicant has also amended claim 43 to recite an image pickup device [...], wherein said image capturing means includes a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, an inside of each of said photoelectric

conversion areas being two-dimensionally partitioned into a plurality of segments, and light-shielding means, wherein an aperture in said light-shielding means corresponds to at least two of said segments in one of said photoelectric conversion areas.

Applicant has also amended claim 44 to recite signal transfer means for transferring said electric charges read from a plurality of said segments through channels being formed beside said photoelectric conversion areas, said channels being formed along perimeters of said photoelectric conversion areas.

Itano et al. merely discloses an image pickup apparatus in which a plurality of pixel areas in which pixels each having a photoelectric conversion unit are arranged two-dimensionally, are arranged on a single semiconductor chip to be adjacent to each other through a predetermined space, and a plurality of microlenses are formed on the plurality of pixels areas and on the predetermined spaces between the plurality of pixel areas (Abstract).

Itano et al. does not disclose a color solid-state image pickup device including a plurality of photoelectric conversion areas and a light-shielding film, wherein the inside of each of the photoelectric conversion areas is two-dimensionally partitioned into a plurality of segments, and wherein an aperture in the light-shielding film corresponds to at least two of the segments in one of the photoelectric conversion areas.

In Itano et al., a solid-state image pickup element 1 includes pixel areas 2a to 2d which serve to pick up an object image. In each pixel area, pixels are arranged two-dimensionally. Color filters 3a and 3c, each having the spectral transmission property of transmitting mainly green light, are formed in front of the pixel areas 2a and 2c. A color filter 3b having the spectral transmission property of mainly transmitting blue light is formed in front of the pixel area 2b. A color filter 3d having the spectral transmission property of mainly transmitting red light is formed in front of the pixel area 2d (FIG. 7, col. 4 lines 65-67, col. 5 lines 1-11). FIG. 10 is a sectional view taken along a line of 10--10 in FIG. 8, which illustrates an arrangement of pixel areas in an image pickup element. FIG. 10 illustrates a sectional view along pixel areas 2b and 2a. FIG. 10 illustrates a photoelectric conversion unit 41, an interconnection layer 42, an insulating layer 43, a light-shielding layer 44, a passivation layer 45, a planarizing layer 46, a green filter 47, a red filter 48, and a microlens 49 (col. 6 lines 47-50).

In Itano et al., the areas corresponding to the photoelectric conversion units 41 are not segments as claimed in claims 1 and 43 and the light-shielding layer 44 is not a light-shielding film or means presenting an aperture as claimed in claims 1 and 43. The pixel areas 2a, 2b, 2c and 2d are not segments as claimed in claims 1 and 43, either.

Specifically, in Itano et al., the light-shielding layer 44 does not present an aperture that corresponds to at least two segments. As illustrated in FIG. 10, the light-shielding layer 44 presents apertures such that each aperture corresponds to one and only one photoelectric conversion unit 41. There is no aperture in the light-shielding layer 44 that corresponds to two or more photoelectric conversion units 41. There is also no aperture in the light-shielding layer 44 that corresponds to two or more pixel areas from among pixel areas 2a, 2b, 2c, and 2d.

In FIG. 12 of Itano et al., a light-shielding layer 24 shields a transistor against light, shielding the floating diffusion area 32, the selective oxide layer 33, a first passivation layer 25 associated with one photodiode 22 (col. 7 lines 55-57). As illustrated in FIG. 12, the aperture in the light-shielding layer 24 corresponds to only one photodiode 22.

Therefore, Itano et al. fails to teach all of the elements for amended claims 1 and 43.

Itano et al. also fails to teach all of the elements for amended claims 2, 19 and 44. Itano et al. does not disclose transfer channels for transferring signal electric charges read from a plurality of segments, the transfer channels being formed beside photoelectric conversion areas, along perimeters of the photoelectric conversion areas. Itano et al. also does not disclose peripheral circuits connected to segments and arranged around photoelectric conversion areas, along perimeters of the photoelectric conversion areas. Itano et al. also does not disclose signal transfer means for transferring electric charges read from a plurality of segments through channels being formed beside photoelectric conversion areas, the channels being formed along perimeters of the photoelectric conversion areas.

In Itano et al., the photoelectric conversion units 41 are not segments, the pixel areas 2a-2d are not segments, and the signal lines 11 that read signals from a pixel are not transfer channels as claimed in claim 2, are not peripheral circuits as claimed in claim 19, and are not signal transfer means as claimed in claim 44. If the pixels corresponding to the photoelectric conversion units 41 were segments, or if each pixel area 2a, 2b, 2c, 2d were one segment, then a

photoelectric conversion area would correspond to a collection of pixel areas 2a, 2b, 2c, and 2d. However, the signal lines 11 are formed inside the pixel areas 2a, 2b, 2c, and 2d, and not along perimeters of the collection of pixel areas 2a, 2b, 2c, and 2d. As it can be seen in FIG. 8, the signal lines 11 pass through the pixel areas 2a, 2b, 2c, and 2d (col. 5 lines 25-30). Similarly, in FIG. 14, a vertical signal line 912 serves to transmit an amplified signal read out from each pixel 905, so that amplified signals are read out to the vertical signal lines 912 of the respective image pickup areas 901 to 904 (col. 9 lines 15-20). As shown in FIG. 14, the signal lines 912 are formed inside image pickup areas 901 to 904, and not along perimeters of the collection of image pickup areas 901-904.

Hence, Itano et al. does not disclose transfer channels as claimed in claim 2, peripheral circuits as claimed in claim 19, or channels as claimed in claim 44.

Hence, with respect to claim 1 as currently amended, Itano et al. fails to disclose, at least, "a light-shielding film, [...] wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas."

Also, with respect to claim 2 as currently amended, Itano et al. fails to disclose, at least, "transfer channels, for transferring said signal electric charges read from a plurality of said segments, are formed beside said photoelectric conversion areas, along perimeters of said photoelectric conversion areas that are partitioned into said plurality of segments which store said signal electric charges of different spectral sensitivities."

Also, with respect to claim 19 as currently amended, Itano et al. fails to disclose, at least, that "peripheral circuits connected to said segments are arranged around said photoelectric conversion areas, along perimeters of said photoelectric conversion areas".

Also, with respect to claim 43 as currently amended, Itano et al. fails to disclose, at least, "a plurality of photoelectric conversion areas provided in an array pattern on a surface of a semiconductor substrate, an inside of each of said photoelectric conversion areas being two-dimensionally partitioned into a plurality of segments, and light-shielding means, wherein an aperture in said light-shielding means corresponds to at least two of said segments in one of said photoelectric conversion areas."

Also, with respect to claim 44 as currently amended, Itano et al. fails to disclose, at least, “signal transfer means for transferring said electric charges read from a plurality of said segments through channels being formed beside said photoelectric conversion areas, said channels being formed along perimeters of said photoelectric conversion areas.”

For all of the above reasons, taken alone or in combination, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. 102 (e) rejection of claims 1, 2, 19, 43 and 44. Claims 3-7, 11-13, 15-16 and 18 depend from claim 1 and are allowable at least by virtue of their dependency. Claims 20-27, 31-33, 35-36, 39-40 and 42 depend from claim 19 and are allowable at least by virtue of their dependency.

Claim Rejections – 35 U.S.C. §103

The Examiner rejected claim 38 under 35 U.S.C. 103(a) as being unpatentable over Itano et al. Applicant traverses this rejection.

Applicant respectfully submits the Examiner has failed to establish a *prima facie* case of obviousness.

Applicant submits that the Examiner's reliance on Itano et al. on page 8 of the Office Action as allegedly pertaining to incremental features of claim 38 fails to make up for the deficiencies of the asserted Itano et al. reference discussed above with respect to independent claim 19. Therefore, the asserted grounds of rejection fail to establish *prima facie* obviousness of claim 38.

The teachings of Itano et al. are presented above in the arguments traversing the §102 rejections of claims 1, 2, 19, 43 and 44. As provided above in the arguments for the allowability of claim 19, Itano et al. fails to teach or suggest all of the elements for amended claim 19.

The Examiner rejected claims 8-10 and 28-30 under 35 U.S.C. 103(a) as being unpatentable over Itano et al. in view of US 6,933,972 (“Suzuki et al.”). Applicant traverses this rejection.

Applicant respectfully submits the Examiner has failed to establish a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, the Examiner has the burden of meeting the basic criterion that the prior art must teach or suggest all of the claim limitations.

Regarding this basic criterion, Itano et al. and Suzuki et al. fail to disclose or suggest a light-shielding film, [...] wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas, as claimed in claim 1. Itano et al. and Suzuki et al. also fail to disclose or suggest that peripheral circuits connected to said segments are arranged around said photoelectric conversion areas, along perimeters of said photoelectric conversion areas, as claimed in claim 19.

Claims 8-10 depend from claim 1. Claims 28-30 depend from claim 19.

The teachings of Itano et al. are presented above in the arguments traversing the §102 rejections of claims 1, 2, 19, 43 and 44. As provided above in the arguments for the allowability of claims 1 and 19, Itano et al. fails to teach or suggest all of the elements for amended claims 1 and 19.

Suzuki et al. merely discloses a MOS type image pickup device having a pixel interleaved array layout and one analog to digital conversion unit provided per each pair of adjacent photoelectric conversion columns. A number of photoelectric conversion elements are disposed in a plurality of rows and columns in a pixel shift layout, and an analog/digital conversion unit is provided per two photoelectric conversion element columns to form a MOS type solid-state image pickup device. (Abstract)

Suzuki et al. does not disclose or suggest a light-shielding film, wherein an aperture in the light-shielding film corresponds to at least two segments in a photoelectric conversion area. A light-shielding film is only mentioned with reference to FIG. 12, in Suzuki et al. FIG. 12 illustrates a MOS type solid state color image pickup device having light shielding film 80, a color filter array 85, a micro lens array 90 and the like added to a MOS type solid state image pickup device that includes a photoelectric conversion element 10 (col. 19 lines 30-38). The light shielding film 80 is formed in order to prevent unnecessary photoelectric conversion in the area other than photoelectric conversion elements 10. The light shielding film 80 has openings 81 at positions corresponding to photoelectric conversion elements 10 (col. 20 lines 11-15). Hence, each opening 81 of the light shielding film 80 corresponds to only one photoelectric conversion

element 10. Suzuki et al. does not disclose or suggest a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities, and an aperture in a light-shielding film, the aperture corresponding to at least two of such segments. Hence, Suzuki et al. fails to teach or suggest all of the elements for claim 1.

Suzuki et al. also does not disclose or suggest peripheral circuits connected to segments, the peripheral circuits being arranged around photoelectric conversion areas, along perimeters of the photoelectric conversion areas.

For example, in FIG. 2 (which illustrates details for FIG. 1A), FIG. 6, FIG. 10 (which illustrates details for FIG. 9) and FIG. 11 of Suzuki et al., output signal lines 30 and row select signal wiring lines 25 are connected to each switching circuit unit 20 (or switching circuit units 120 in FIGS. 10 and 11) provided for each photoelectric conversion element 10. As it can be seen in FIGS. 2, 6, 10 and 11, the output signal lines 30 and row select signal wiring lines 25 meander through and in between switching circuit units 20. No collection of switching circuit units 20 can form a photoelectric conversion area, for which peripheral circuits connected to the switching circuit units 20 are arranged around the photoelectric conversion area, along a perimeter of the photoelectric conversion area. This is so because output signal lines 30 and row select signal wiring lines 25 meander through and in between switching circuit units 20 (or 120) in such a way that any collection of switching circuit units 20 (or 120) would include at least one output signal line 30 and/or row select signal wiring line 25 passing through the collection of units 20. Hence, Suzuki et al. fails to teach or suggest all of the elements for claim 19.

The Examiner rejected claim 41 under 35 U.S.C. 103(a) as being unpatentable over Itano et al. in view of US 5,289,269 ("Sugimori et al."). Applicant traverses this rejection.

Applicant respectfully submits the Examiner has failed to establish a *prima facie* case of obviousness.

Claim 41 depends from claim 1.

Itano et al. and Sugimori et al. fail to disclose or suggest a light-shielding film, [...] wherein an aperture in said light-shielding film corresponds to at least two segments in one of said photoelectric conversion areas, as claimed in claim 1.

As provided above in the arguments for the allowability of claim 1, Itano et al. fails to teach or suggest a light-shielding film, [...] wherein an aperture in said light-shielding film corresponds to at least two of said segments in one of said photoelectric conversion areas, as claimed in claim 1.

Sugimori et al. merely discloses obtaining interlaced television signals from four image pickup devices. A luminance or green signal in the interlaced television signals consists of two interlaced channels. These two channel luminance or green signals are combined to produce the non-interlaced signal without modifying the driving frequency of the image pickup devices (Abstract).

Sugimori et al. does not discuss photoelectric conversion areas for which the inside is two-dimensionally partitioned into a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities. Sugimori et al. also does not discuss light-shielding films. Hence, Sugimori et al. does not discuss a light-shielding film wherein an aperture in the light-shielding film corresponds to at least two segments in one photoelectric conversion area. Hence, Sugimori et al. fails to teach or suggest all of the elements for claim 1.

The Examiner rejected claims 17 and 37 under 35 U.S.C. 103(a) as being unpatentable over Itano et al. in view of US 5,506,430 ("Ohzu"). Applicant traverses this rejection.

Applicant respectfully submits the Examiner has failed to establish a *prima facie* case of obviousness.

Ohzu fails to disclose or suggest a light-shielding film, [...] wherein an aperture in the light-shielding film corresponds to at least two segments in one photoelectric conversion area, as claimed in claim 1. Ohzu also fails to disclose or suggest that peripheral circuits connected to segments are arranged around photoelectric conversion areas, along perimeters of photoelectric conversion areas, as claimed in claim 19.

Claim 17 depends from claim 1. Claim 37 depends from claim 19.

Ohzu merely discloses a solid state image pick-up device which has a first pixel for outputting a first color signal and a second pixel for outputting a second color signal different from the first color signal. The first and second pixels have semiconductor junctions between the

first semiconductor region and the second semiconductor region, respectively, with different junction capacities from each other. (Abstract)

FIG. 4 of Ohzu illustrates a linear color solid state image pick-up device, with three color filters (not shown) of primary colors R, G, B. One pixel with an R filter disposed, one pixel with a G filter disposed, and one pixel with a B filter disposed constitute one triad, and such triads are arranged as an array. The color filter is not shown in FIGS. 4 and 5, but is provided on the opening portion of each pixel. FIG. 5 is a longitudinal cross-sectional view of one pixel (U_R) of FIG. 4. In FIG. 5, 5 is a light shielding membrane (col. 5 lines 38-50). The light shielding membrane 5 has an opening at a position corresponding to the base region 2 for a transistor pixel. Hence, the opening in the light shielding membrane 5 corresponds to only one pixel. A light shielding layer 314 in FIG. 10 also has an opening that corresponds to only one pixel, namely pixel 316R. Hence, Ohzu does not disclose or suggest a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities, and an aperture in a light-shielding film, the aperture corresponding to at least two of such segments. Therefore, Ohzu fails to teach or suggest all of the elements for claim 1.

Ohzu also does not disclose or suggest peripheral circuits connected to segments and arranged around photoelectric conversion areas, along perimeters of photoelectric conversion areas.

FIG. 9 of Ohzu is a longitudinal cross-sectional view of a pixel near a light receiving portion thereof, taken along the line B-B' of FIG. 8, and FIG. 10 is a transverse cross-sectional view of a pixel near the light receiving portion, taken along the line C-C' of FIG. 8. On a P-type silicon substrate 301 is disposed a pixel array 330 surrounded by an element isolation region 303 of P-type silicon, in which a transistor BPT constituting one pixel involves a collector region having n^+ type buried layer 302, n^+ type contact layer 304, and epitaxial layer 305, a base region having P-type semiconductor layer 307, and an n^+ type emitter region 308 (col. 7 lines 40-50). The n^+ type contact layer 304 for pixel 316R (FIG. 10) is found on both sides of pixel 316R, adjacent to pixel 316G for example.

As it can be seen in FIG. 10 of Ohzu, the n^+ type contact layer 304 for each pixel is between the respective pixel and the adjacent pixels. Hence, no collection of pixels from the

pixel array 330 can form a photoelectric conversion area for which peripheral circuits connected to the pixels are arranged around the photoelectric conversion area, along a perimeter of the photoelectric conversion area. That is because n^+ type contact layers 304 are located between every two adjacent pixels, hence any collection of pixels will include at least one set of n^+ type contact layers 304 located inside the collection of pixels. Hence, Ohzu fails to teach or suggest all of the elements for claim 19.

The Examiner rejected claims 14 and 34 under 35 U.S.C. 103(a) as being unpatentable over Itano et al. in view of US 5,063,439 ("Tabei"). Applicant traverses this rejection.

Applicant respectfully submits the Examiner has failed to establish a *prima facie* case of obviousness.

Tabei fails to disclose or suggest a light-shielding film, [...] wherein an aperture in the light-shielding film corresponds to at least two segments in one photoelectric conversion area, as claimed in claim 1. Tabei also fails to disclose or suggest that peripheral circuits connected to segments are arranged around photoelectric conversion areas, along perimeters of the photoelectric conversion areas, as claimed in claim 19.

Claim 14 depends from claim 1. Claim 34 depends from claim 19.

Tabei merely discloses a solid state pickup system having improved color reproducibility characteristics. The solid state pickup system uses additional photodetector elements to produce color signals including wavelength components in areas of negative stimulus values. These color signals are subtracted from conventionally produced color signals, such conventionally produced color signals being incapable of representing the negative stimulus values. The algebraic difference between the color signals resulting from the subtraction operation results in a color signal adequately represented in a wider range of wavelength characteristics, including the negative stimulus values, to improve color reproducibility (Abstract).

Tabei does not discuss photoelectric conversion areas for which the inside is two-dimensionally partitioned into a plurality of segments which output a plurality of photoelectric conversion signals of different spectral sensitivities. Tabei also does not discuss light-shielding films. Hence, Tabei does not discuss a light-shielding film wherein an aperture in the light-

shielding film corresponds to at least two segments in one photoelectric conversion area. Hence, Tabei fails to teach or suggest all of the elements for claim 1.

Tabei also does not discuss peripheral circuits. Hence, Tabei does not disclose or suggest peripheral circuits connected to segments which output photoelectric conversion signals having a plurality of different spectral sensitivities, the peripheral circuits being arranged around photoelectric conversion areas, along perimeters of photoelectric conversion areas. Hence, Tabei fails to teach or suggest all of the elements for claim 19.

For all of the above reasons, taken alone or in combination, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. 103 (a) rejections of claims 8-10, 14, 17, 28-30, 34, 37-38 and 41.

Conclusion

In view of the above amendments and remarks, this application appears to be in condition for allowance and the Examiner is, therefore, requested to reexamine the application and pass the claims to issue.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Corina E. Tanasa, Limited Recognition No. L0292 under 37 CFR §11.9(b), at telephone number (703) 208-4003, located in the Washington, DC area, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: September 14, 2007

Respectfully submitted,

By 

Michael R. Cammarata

Registration No.: 39,491

BIRCH, STEWART, KOLASCH & BIRCH, LLP

8110 Gatehouse Road, Suite 100 East

P.O. Box 747

Falls Church, Virginia 22040-0747

(703) 205-8000

Attorney for Applicant